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A METHODOLOGY TO IMPROVE PACKET DELIVERY AND REDUCING OVERHEAD IN POWER HETEROGENEOUS MOBILE AD HOC NETWORK

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Abstract— *Power Heterogeneity is common in Mobile Ad Hoc Networks (MANETs).High-power nodes in MANETs can improve network scalability, connectivity, and broadcasting robustness. So In this paper, to overcome the drawback of not using high power nodes for data transmission in the existing system, a clustering method is implemented. Clustering is the group of formation of infrastructure less networks together. By applying clustering in the Loose-Virtual-Clustering-Based (LVC) based routing algorithm, packets can be transmitted through high battery power of nodes. The results shows that using clustering method for data transmission through high power nodes increases the packet delivery capacity, reduces overhead and delay in power heterogeneous Mobile Ad Hoc Network (MANET) .*

Keywords—MANETs, LVC.

1 Introduction

In today’s technology, Mobile Ad-hoc networks are prominent role in wireless communication. An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any stand-alone infrastructure or centralized administration. Mobile Ad-hoc networks are self-organizing and self re-configuring multihop wireless networks where, the structure of the network changes dynamically. This is mainly due to the mobility of the nodes. The nodes in the network not only act as hosts but also as routers that route data to/from other nodes in network.

In the case of ad-hoc networks, each node must be able to forward data for other nodes. This creates additional problems along with the problems of dynamic topology which is unpredictable connectivity changes. MANETS rely on wireless transmission, a secured way of message transmission is important to protect the privacy of the data. An insecure ad-hoc network at the edge of an existing communication infrastructure may potentially cause the entire network to become vulnerable to security breaches.

Mobile devices identities or their intentions cannot be predetermined or verified. Nodes may refuse to cooperate by not forwarding packets for others for selfish reasons and not want to exhaust their resources. Various other factors make the task of secure communication in ad hoc wireless networks difficult include the mobility of the nodes, a promiscuous mode of operation, limited processing power, and limited availability of resources such as battery power, bandwidth and memory. Most routing protocols lead nodes to exchange network topology information in order to establish communication routes. This information is sensitive and may become a target for malicious adversaries to attack the network or the applications running on it.

There are two sources of threats to routing protocols. The first comes from external attackers. By injecting erroneous routing information, replaying old routing information, or distorting routing information, an attacker could successfully partition a network or introduce a traffic overload by causing retransmission and inefficient routing. The second and more severe kind of threat comes from compromised nodes, which might (i) misuse routing information to other nodes or (ii) act on applicative data in order to induce service failures.

The active attacks are further classified into internal attacks and external attacks are carried out by nodes that do not belong to network and can be prevented by firewalls and encryption techniques. Internal attacks are from internal nodes which are actually authorized nodes and part of the network hence it is difficult to identify.

2 PROJECT DISCRIPTION

Numerous routing protocols have been developed in the wireless networking community to target various scenarios, and much research effort has been paid to study the taxonomy of adhoc routing protocols and to survey the representative protocols in different categories. For provided the comprehensive summary of the routing protocols for MANETs. Unfortunately, most of the existing protocols are limited to homogenous networks and performing effectively in power heterogeneous networks. There are some routing protocols for heterogeneous MANETs. Multiclass (MC) is a position-aided routing protocol for power heterogeneous MANETs. The idea of MC is to divide the entire routing area into cells and to select a high power node in each cell as the backbone node (B-node). Then, a new medium access control (MAC) protocol called hybrid MAC (HMAC) is designed to cooperate with the routing layer. Based on the cell structure and HMAC, MC achieves better performance. A fixed cell makes MC to work well only in a network with high density of high-power nodes. In a cross-layer approach is presented that simultaneously extends the MAC and a network layer to minimize the problems caused by link asymmetry and exploits the advantages of heterogeneous MANET.

In particular, an algorithm at the network layer was proposed to establish reverse paths for unidirectional links and to share the topological information with the MAC layer. In the link layer, a new MAC protocol was presented based on IEEE 802.11 to address the heterogeneous hidden/exposed terminal problems in power heterogeneous MANETs.

Advantages of AODV:

Routes are established on demand and destination sequence numbers are used to find the latest route to the destination. Lower delay for connection setup.

Disadvantage of AODV:

AODV doesn't allow handling unidirectional links, heavy control overhead. Periodic beaconing leads to unnecessary bandwidth consumption.

In between the data transmission of nodes from source to destination from node 0 to node 6 apply the same energy, radio, capacity and transmission range, so it is called as homogeneous.

Similarly in between the data transmission of nodes from node 0 to node 6 have to apply the different energy, radio, and capacity and with different transmission range in a topology so it is called as heterogeneous.

2.1 Existing system:

Most of the existing protocols are limited to homogenous networks and perform ineffectively in power heterogeneous networks. A cross-layer-designed device–energy–load aware relaying (DELAR) framework that achieves energy conservation from multiple facets, including power-aware routing, transmission scheduling, and power control, is proposed. DELAR mainly focuses on addressing the issue of energy conservation in heterogeneous MANETs. Demerit of Most of the existing systems all are depend on geographical routing

2.2 Proposed system:

Our proposal ultimate aim is to Converting homogeneous network protocol in to heterogeneous network protocol

Example: AODV routing protocol.

To improve the network performance and to address the issues of high-power nodes, they propose a loose-virtual-clustering-based routing protocol. LRPH consists of two core components. The first component is used to tackle the unidirectional link and to construct the hierarchical structure. The second component is the routing, including the route discovery and route maintenance.

2.2.1 Advantages:

It does not rely on geographic information or multi-radio multi-channels and can be deployed on general mobile devices, including laptops, personal digital assistants

2.2.2 ARCHITECTURE:

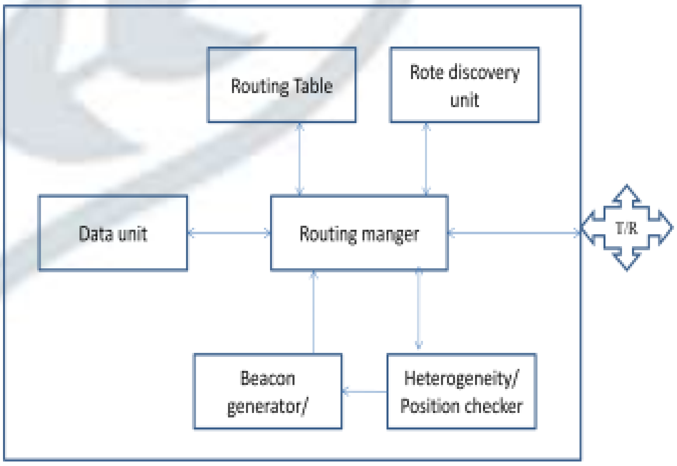

Fig 2.2.2 Architecture of network device

InFig 2.2.2.there are devices consist with Data unit, routing table information, route discovery unit, Hello (beacon) message generator, heterogeneity analyzer, and route discovery unit, these all the blocks will be controlled by network manager.

2.3 Modules:

To improve our project work, they had divided our project into small modules. There are given below,

Query Generation

Geo position/Beacon message generation

Clustering/non clustering communication

2.3.1 Query Generation:

In general, the node which is has the data to destination and without route then the node needs to find the route to destination. In such a case, node will broadcast the query to all neighbor nodes. The query packet has different fields to share the multiple information while find the route.

There are the some main fields, like Source airs, Destination adrs, seq number, current node adders, and coverage area of current node adrs, GPS value for Geo bunching (grouping or clustering).

Srcaddrs	Dstaddrs	Current ndaddrs	Pkt id/sq number	Covg area	GPS

Fig 2.3.1 the query packet structure

If the source has no route to the destination, then source v initiates the route discovery in an on-demand fashion.

After generating RREQ, node looks up its own neighbor table to find if it has any closer neighbor node toward the destination node.

If a closer neighbor node is available, the RREQ packet is forwarded to that node.

If no closer neighbor node is the RREQ packet is flooded to all neighbor nodes.

2.3.2 Geo Position/Beacon Message Generation:

In Geo Position/Beacon Message Generation each node has to check the heterogeneity problem, to check the heterogeneity problem; our base model has used the Hello (Beacon message) sharing.

To eliminate unidirectional links, In particular, each node periodically sends a bidirectional neighbor discovery packet, The discovered neighbors refer to the nodes learned by the received BEACON packet. All nodes build aware neighbor (AN) and BN tables based on the received BEACON packets. Using the BN table, the BNs can be identified. Such as srcaddrs, forwarder addrs, sq number,

Srcaddrs	Forwarder addrs	Pkt id/seq number

Fig. 2.3.2 (a) the Beacon packets structure

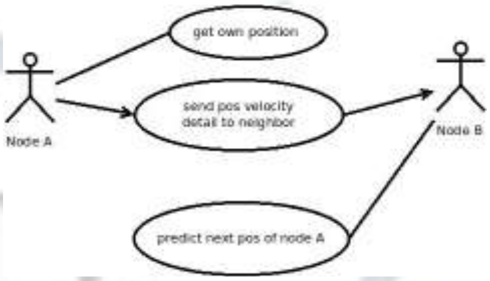

Fig 2.3.2 (b) Collecting the geo position and share to neighbor while route discover

a)Route Discovery from Source:

If the source A has no route to the destination, then source A initiates the route discovery in an on-demand fashion. After generating RREQ, node looks up its own neighbor table to find if it has any closer neighbor node toward the destination node. If a closer neighbor node is available, the RREQ packet is forwarded to that node. If no closer neighbor node is the RREQ packet is flooded to all neighbor nodes.

When a node obtains a complete source route to D, it replies with a RREP packet to S directly and notifies S about the discovered route. Because the RREP packet is delivered using unicast, the bidirectional links will be used. However, the links between B-nodes and G-nodes in the discovered route may be unidirectional. Consequently, those unidirectional links must be repaired. In addition, by considering the fact that transmitting through B-nodes can dramatically degrade the throughput of a network, our scheme will try to exclude B-nodes in the path by replacing B-nodes with multi hop G-nodes. Although this scheme may increase route hops and delay, network throughput can be ultimately improved. Fig. Shows an example to illustrate how to process the RREP packet. Assume that the route to destination is S →· · · → a → B1 → c → d · · · → D, where B1 → c is a unidirectional link. Therefore, when c receives the RREP packet, it replaces the route a → B1 → c in the RREP packet with multi-hop G-nodes a → m → n → c. Notice that this route can be obtained through the LAT table. As a result, S receives a bidirectional route to D with as few B-nodes as possible. In addition, a timer is set to initiate a new round of route discovery until the timer expires, and there is no response from the RREP packets. If the

route discovery fails for several times, data transmission will ultimately be canceled.

First, our technique takes the large coverage space for B-nodes to the broadcast RREQ packet. Hence, the delay from the route discovery can be improved. Second, forwarding rules for the RREQ packet is based on the state of a node and local topology information; therefore, redundant transmissions of RREQ packets can be avoided, and the overhead of the route discovery procedure can be significantly reduced. Third, our scheme intends to avoid forwarding data packets through B-nodes; therefore, the impact of B-nodes on network throughput can be largely reduced.

Finally, LRPH is adaptive to the density of B-nodes for LVC. In an extreme case where no B-node exists in the network, i.e., the state of all nodes belongs to G isolated; LRPH becomes a routing protocol similar to classical source routing. The difference is that LRPH forwards data packets through bidirectional links and improves transmission efficiency.

.b) Route Maintenance Procedure:

When a middle node on the route detects the link failure through the BN table, the route maintenance is activated. First, a route error (RERR) packet is created and sent to the source node along the reverse route. When any middle node (including the source node) along the route receives the RERR packet, the route with the broken link will be removed from the routing cache. When the source receives the RERR packet, a new round of route discovery procedure will be activated.

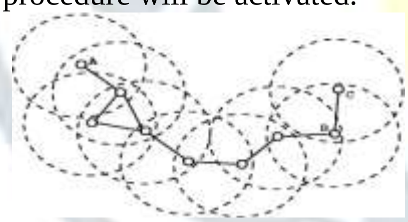

Fig 2.3.2 (c) Flooding the query packet

c)Beacon Sharing In Heterogeneous:

Each node broadcasts BEACON packets within one hop and notifies all neighbors about its type or state after detecting the heterogeneous property. After sending BEACON packets, each 3node waits for TBEACON to collect BEACON packets sent from its neighbors. The received BEACON packets will be used to construct the AN table, which stores the information (e.g., ID, type, state, etc.) of all B G discovered nodes. As a result, AN = NRB (gi) ∩ NRG (gi). After waiting for TBEACON, each node broadcasts BEACON packets again. In this step, the information on the node itself and all nodes in the AN table will be added to the BEACON packets. When receiving BEACON packets, each node will check whether its own node information is in the BEACON packets. If so, a bidirectional link between the current node and the sender of that BEACON packet will be determined. Then, the sender of the BEACON packet will be added into the BN table. B G As a result, BN = NRG (gi) ∩ NRG (gi).

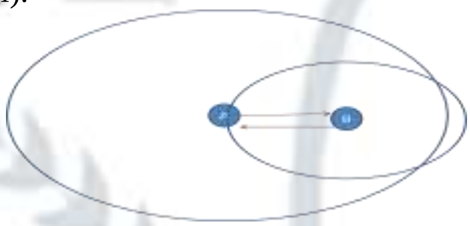

Fig 2.3.2 (d) Beacon sharing

2.3.3 Clustering (Bunching):

To exploit the benefits of B-nodes, they design a novel LVC algorithm. In LVC, a B-node is chosen as the cluster head and establishes a loose coupling relationship with G-nodes. Different from the strong coupling clustering, only G-nodes under the coverage of B-nodes will participate in the clustering. Consequently, only G-nodes in the gateway state will be involved in the clustering, whereas those nodes uncovered by the B-nodes will not be involved in the clustering. Two features appear in LVC.

First, the loose clustering avoids heavy overhead caused by reconstructing and maintaining the cluster when the density of B-nodes is small. Second, LRPH protocol can be adaptive to the density of B-nodes, even when all G-nodes are in the G isolated state. All nodes build a local aware topology table by exchanging control packets during building LVC. Notice that the LAT table stores local topology information based on discovered bidirectional links. The detailed procedures for constructing LVC are presented in the following.

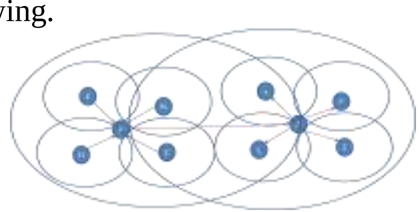

Fig. 2.3.3 Bunching G-node and B-node

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2.3.4 ALGORITHM:

Fig.2.3.4 Algorithm flow

Two types of nodes B and G

B-NODE(High amount of coverage area and high battery power)
G-NODE(Normal Nodes)

a)Cluster Formation Phase:

Initially all nodes will send hello Message
If any node received B-NODE packet it will give CMP(Cluster Member Packet)
Then B-node will give CHP(Cluster head packet) as confirmation
If more than two B-NODES messages are received means it will find which is the shortest distance and it will join in the particular cluster.
If no B-NODE packet is received it will become as an Independent Node (Loose Clustering).

b)Path Establishment:

If node want to transmit the data
It will check whether any path is available or not in routing table
If available transmit the data

C)If not find path

Send RREQ(Route request)
Intermediate nodes will check that request as well as Heterogeneity
If positive value means it will forward to other nodes
If negative value means generate hello message
Set timer
If reply came in that time it is a bidirectional link and send RREP(Route Reply)
If not it is uni-directional link, ignore it…..

2.4 Network creation with nodes:

In ad-hoc routing since the topology is not constant. The mobile node might move or medium characteristics might change. In ad-hoc networks, routing tables must some how reflect these changes in topology and routing algorithms have to be adapted. For example in a fixed network routing table updating takes place for every 30sec. This updating frequency might be very low for ad-hoc networks. According algorithm Let us consider b node and g node where b nodes are high amount of coverage area and high battery power and g nodes are normal nodes and create a infrastructure less heterogeneous network.

While source transmitting data to the destination in between high-power nodes are present due to high amount of coverage area and high battery power transmit the data to the destination but destination does not give reply to the source so it is called as

unidirectional transmission of data. By applying LRPH technique detects the unidirectional path and maintained the routing system. Source discovers other route to transmit data and maintains that route till data reaches to the destination and gets reply from the destination. This is called as bidirectional path.

In bidirectional path data transmitting from source to destination and destination gives reply to the source, nodes often change their location within network. So, some stale routes are generated in the routing table which leads to unnecessary routing overhead these will increase data transmission delay from source to and destination. In extension to overcome overhead and delay in the network clustering technique is came in to existence. The grouping of formation of infrastructure less network together is called as clustering. if more than one high-power node is present in cluster formation Initially all nodes will send hello Message if any high-power node received reply from the remaining nodes so reply packet is cluster member packet and the reply received one of the high-power node is cluster head If more than two reply packets are received to the high-power node from the remaining nodes means it will find which is the shortest distance and it will join in the particular cluster and another one become as an Independent Node Loose Clustering. By this improves the network performance increases the packet delivery reduces overhead and delay

a) Interference of high-power nodes:

This is the major problem with mobile ad-hoc networks as links come and go depending on the transmission characteristics, one transmission might interfere with another one and node might overhead transmissions of other nodes and can corrupect the total transmission.

b) Asymmetric or unidirectional links

In a MANET (Mobile Ad-hoc Network) where node B sends a signal to node A but this does not tell anything about is the quality of the connection in the reverse direction.

c) Overhead in routing system:

In wireless adhoc networks, some stale routes are generated in the routing table which leads to unnecessary routing overhead.

d) Increasing packet delivery and reducing delay:

The grouping of MANET together is called as clustering. By clustering infrastructure less network increasing packet delivery and reduces the delay.

3 SIMULATION RESULTS

There are two types of outputs.

1. Nam Winslow
2. Xgraph

By using AODV protocol develop a loose-virtual-clustering-based (LVC) routing protocol for power heterogeneous MANETs, i.e., LRPH. Our protocol is compatible with the IEEE 802.11distributed coordination function (DCF) protocol. It does not rely on geographic information or multi radio multichannel and can be deployed on general mobile devices, including laptops, personal digital assistants, etc. LRPH takes the double-edged nature of high-power nodes into account. To exploit the benefit of high-power nodes, a novel hierarchical structure is maintained in LVC, where the unidirectional links are effectively detected. Clustering is a known scheme to improve the performance of the networks. In a strong coupling cluster, the cost of constructing and maintaining a cluster may significantly increase and affect the network performance. In our clustering, a loose coupling relationship is established between nodes. Based on the LVC, LRPH is adaptive to the density of high-power nodes. In such case, by developing routing algorithms to avoid packet forwarding via high-power nodes. By conducting extensive analysis, simulations, and real-world experiments to validate the effectiveness of LRPH. Simulation results show that LRPH achieves much better performance than other existing protocols. By implemented LRPH in Microsoft Wince environment and conducted real-world experiments. Our data matches the theoretical and simulation findings well.

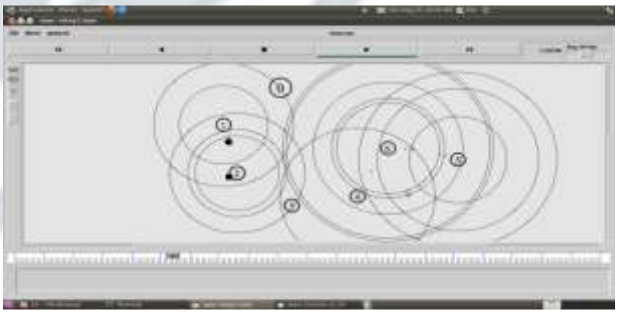
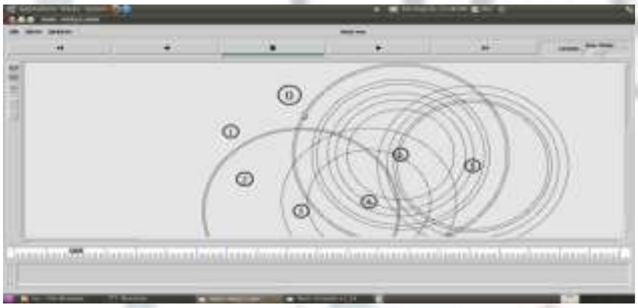


Fig 3.1 homogeneous AODV output

In the above fig 3.1 according to algorithm let’s assume node 0 has high battery power and

node 1 to node 6 are normal nodes In between node 0 to node 6 applied the same energy, radio, capacity and transmission power, so it is called as homogeneous.

Similarly in between node 0 to node 6 applied the different energy, radio, capacity and with different transmission range in a topology so it is called as heterogeneous. In homogeneous network packets are delivering from source (node1) to destination (node5) due to noise disturbances some packets are



dropped.

Fig 3.2 heterogeneous AODV output

In fig 3.2 observed that forward path is established from node 1 to node 0 and node 0 to node 6 and node 6 to node 5 but does not exists reverse path because the node 6 is out of the transmission range of node 0 then their exits unidirectional path of transmission, so it will choose another path to transmit data packets from source to destination.

In the below figure observed the window showing that instead of transmitting data packets from node 0 to node 6 it will choose another path.

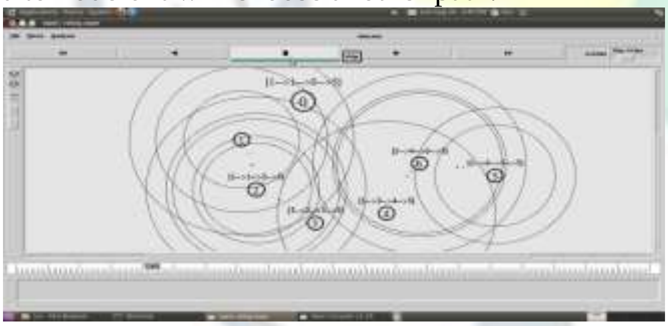


Fig 3.3 LRPH unidirectional link

In above fig 3.3 The packets transmitting forward path from node1 to node2 and node2 to anode3 and node3 to node4 and node4 to node 6 and node6 to node5 and reverse path from node5 to node6 and node6 to node4 and node4 to node3 and node3 to node 2 and node2 to node1 so the paths established from source node (1) to destination node (5) vice versa but in the output observed that route hops are increased and delay is increased and overhead is also increased.

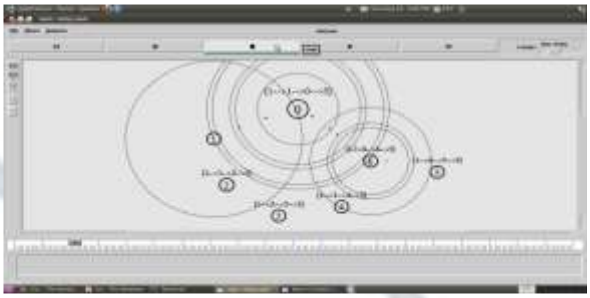


Fig 3.4 LRPH bidirectional link

By applying clustering in the LVC based routing algorithm packets are transmitted high battery power of nodes.

In the fig 3.4 let's consider the node 1 sis source and node 5is destination and node o has high battery power and observed that forward path is established from node 1 to node 0 and node 0 to node 6 and node 6 to node 5 and reverse path is established from node 5 to node 6 and node 6 to node 0 and node 0 to node 1 by applying clustering increases the packet delivery and reduces overhead and delay

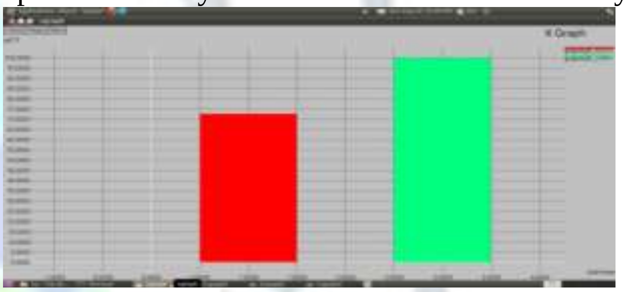


Fig 3.5 showing the improvement of packet delivery fraction between AODV and LRPH

Y axis is showing the packet delivery fraction and X axis is showing the protocol used red one is AODV and green one is LRPH.

In the above fig 3.5 observed that by using LRPH technique in the AODV protocol packet delivery fraction is increased so in AODV protocol before applying LRPH technique the packet delivery fraction is decreased due to noise disturbance when packet transmitting from source to destination

Fig3.6 showing reducing of overhead between AODV and LRPH

Y axis is showing overhead and X axis is showing the protocol used red one is AODV and green one is LRPH.

In the above fig 3.6 observed that by using LRPH technique in the AODV protocol overhead is increased due to route hops by applying clustering to the LRPH of AODV protocol the overhead is reduced

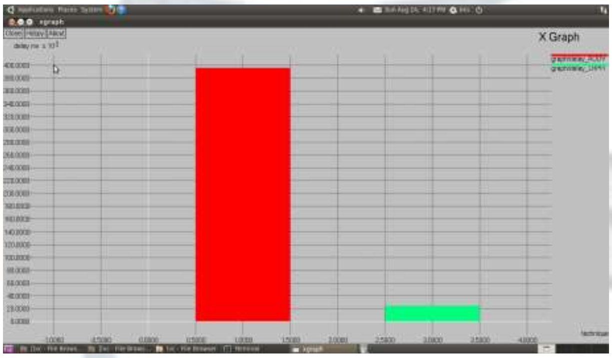


Fig 3.7 showing reducing of delay between AODV and LRPH

Y axis is showing delay and X axis is showing the protocol used red one is AODV and green one is LRPH.

In the above fig 3.7 observed that by using LRPH technique in the AODV protocol delay is increased due to route hops by applying clustering to the LRPH of AODV protocol the delay is reduced

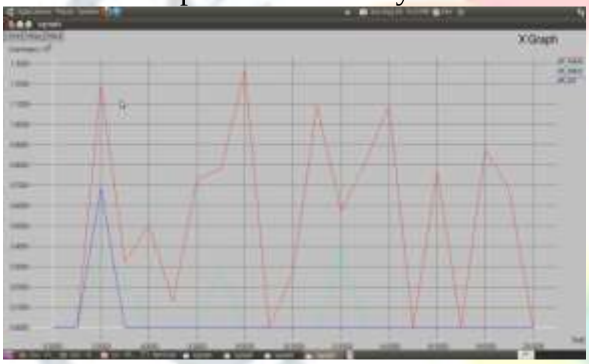


Fig 3.8 showing the reducing of overhead at different levels in HOMO, HETRO and LVC

In the fig 3.8 observed that over head in homogeneous networks and heterogeneous network is high by applying clustering to the LRPH of AODV protocol in the heterogeneous network is overhead is reduced with respect to the time

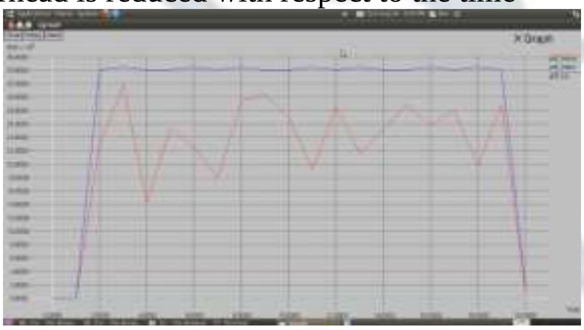


Fig 3.9 shows the improvement of packet delivery fraction at different levels in HOMO,HETRO&LVC

In the fig 3.9 observed that packet delivery fraction in homogeneous network is due to noise disturbance and in heterogeneous network packet delivery fraction is reduced due to high power of nodes applying clustering to the LRPH of AODV protocol in the heterogeneous network packet delivery fraction is increased with respect to the time.

4 CONCLUSIONS AND FUTURE SCOPE

The power heterogeneous MANETs can be severely impacted by high-power nodes. A LVC Routing Protocol for Power Heterogeneous is developed routing schemes to avoid packet forwarding through high-power node and makes to choose the other path to transmit data from source to destination. This increases overhead and delay in the power heterogeneous MANET. By using clustering with LVC in power heterogeneous MANEs, data can be transmitting through the high power nodes. The results show that increases the network performance improved the packet delivery fraction and reduces overhead and delay. In future, data can be secured through high power nodes by applying various encryption techniques.

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